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propagation equation accounting for a thermal profile of a medium surrounding the well;

- b) measuring a temperature of the drilling fluid at a well inlet T1, a temperature at a bottom of the well T2, and a temperature at a well outlet T3; and wherein
- c) the expressions  $\theta 1$  and  $\theta 2$  meet temperature boundary conditions of T1, T2 and T3.

12. A method as claimed in claim 11 comprising, after step c):

- d) providing a drilling fluid having a thermal profile which is a function of the depth.

13. A method as claimed in claim 11 wherein:

repeating steps b), c) and d) to obtain a real-time temperature profile.

14. A method as claimed in claim 11, wherein:

in step a), expressions  $\theta 1$  and  $\theta 2$  comprise unknown constants, and  
in step c), expressions  $\theta 1$  and  $\theta 2$  are made to meet the boundary temperature conditions T1, T2 and T3 by determining the unknown constants.

15. A method as claimed in claim 11 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a

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balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

16. A method as claimed in claim 11, wherein:

in step a) a heat propagation equation in a homogeneous medium on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

17. A method as claimed in claim 11 wherein:

in step a) expressions  $\theta_1$  and  $\theta_2$  are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the surrounding annulus are continuous.

18. A method as claimed in claim 11, applied to a vertical offshore well wherein:

in step a) each expression  $\theta_1$  and  $\theta_2$  are split into independent equations by accounting for a thermal profile of a medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the surrounding annulus are continuous.

19. A use of the method as claimed in claim 11, wherein:

calculation of pressure drops of the drilling fluid circulating in the well during drilling are made.

20. A use of the method as claimed in claim 11, wherein:

calculation of hydrate formation zones in the drilling fluid during drilling are made.--

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